



PNTC143X/123J/143Z/114Y/124XQB-Q series

50 V, 100 mA NPN resistor-equipped transistors

Rev. 1 — 1 October 2021

Product data sheet

1. General description

100 mA NPN Resistor-Equipped Transistor (RET) family in an ultra small DFN1110D-3 (SOT8015) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

Type number	R1	R2	Package		PNP complement:
	k Ω	k Ω	Nexperia	JEDEC	
PNTC143XQB-Q	4.7	10	SOT8015	MO-340BA	PDTA143XQB-Q
PNTC123JQB-Q	2.2	47			PDTA123JQB-Q
PNTC143ZQB-Q	4.7	47			PDTA143ZQB-Q
PNTC114YQB-Q	10	47			PDTA114YQB-Q
PNTC124XQB-Q	22	47			PDTA124XQB-Q

2. Features and benefits

- 100 mA output current capability
- Built-in resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- Low package height of 0.5 mm
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- Digital applications
- Cost saving alternative for BC847-Q series in digital applications
- Controlling IC inputs
- Switching loads

4. Quick reference data

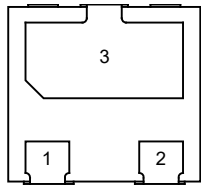
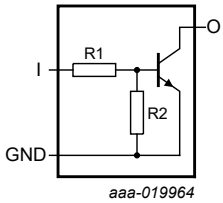
Table 2. Quick reference data

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	50	V
I_O	output current		-	-	100	mA

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I	input (base)	 Transparent top view	 aaa-019964
2	GND	GND (emitter)		
3	O	output (collector)		

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PDTC143XQB-Q	DFN1110D-3	plastic leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.65 mm pitch; body: 1.1 x 1.0 x 0.48 mm	SOT8015
PDTC123JQB-Q			
PDTC143ZQB-Q			
PDTC114YQB-Q			
PDTC124XQB-Q			

7. Marking

Table 5. Marking

Type number	Marking code
PDTC143XQB-Q	E7
PDTC123JQB-Q	E3
PDTC143ZQB-Q	E8
PDTC114YQB-Q	E2
PDTC124XQB-Q	E5

8. Limiting values

Table 6. Limiting values

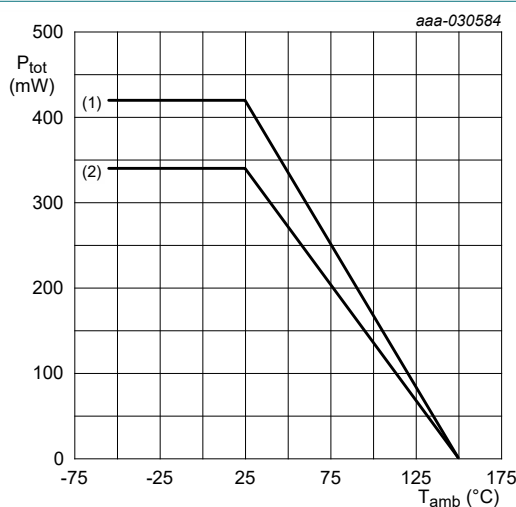
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	50	V
V_{CEO}	collector-emitter voltage	open base	-	50	V
V_{EBO}	emitter-base voltage				
	PDTC143XQB-Q	open collector	-	7	V
	PDTC123JQB-Q		-	5	V
	PDTC143ZQB-Q		-	5	V
	PDTC114YQB-Q		-	6	V
	PDTC124XQB-Q		-	7	V
V_i	input voltage				
	PDTC143XQB-Q		-7	+30	V
	PDTC123JQB-Q		-5	+12	V
	PDTC143ZQB-Q		-5	+30	V
	PDTC114YQB-Q		-6	+40	V
	PDTC124XQB-Q		-7	+40	V
I_O	output current		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1] -	340	mW
			[2] -	420	mW
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		-55	150	°C
T_{stg}	storage temperature		-65	150	°C

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided; 35 μm copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB; single-sided; 70 μm copper; tin-plated and standard footprint.



(1) FR4 PCB; single-sided; 70 μm copper; standard footprint

(2) FR4 PCB; single-sided; 35 μm copper; standard footprint

Fig. 1. Power derating curves

9. Thermal characteristics

Table 7. Thermal characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	368	K/W
			[2]	-	-	298	K/W

- [1] Device mounted on an FR4 PCB; single-sided; 35 μm copper; tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB; single-sided; 70 μm copper; tin-plated and standard footprint.

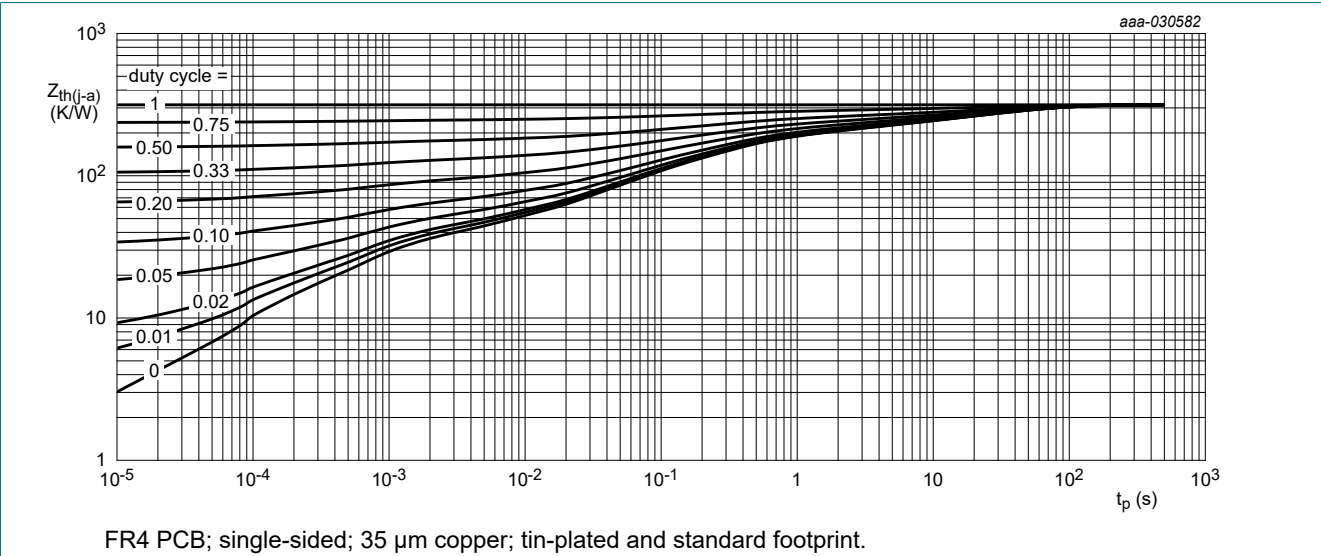


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

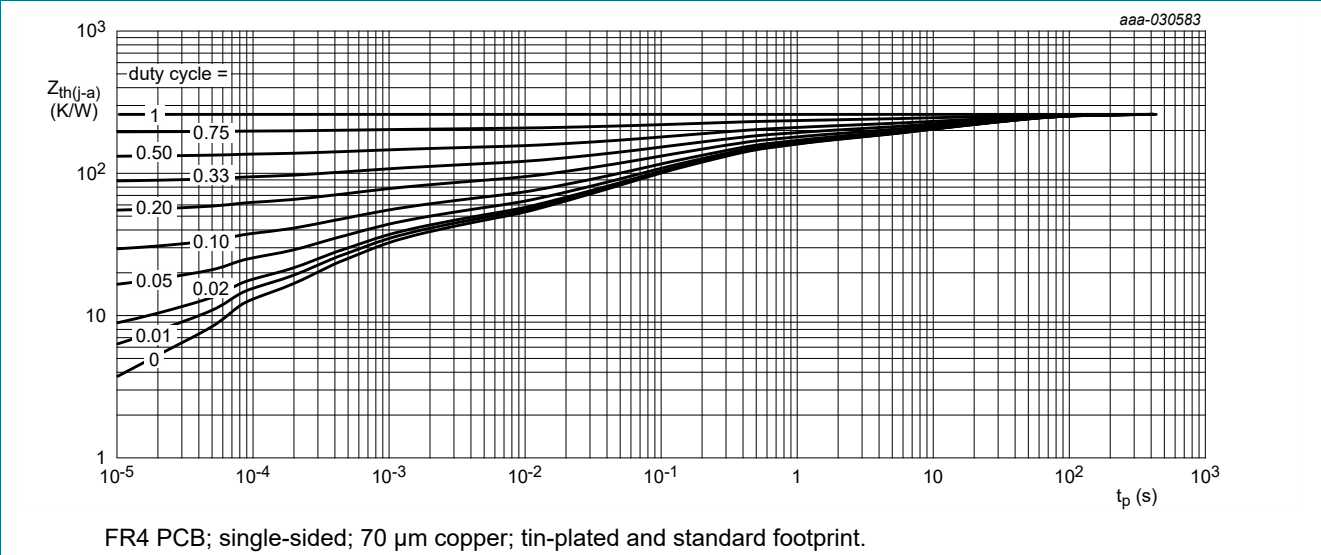


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

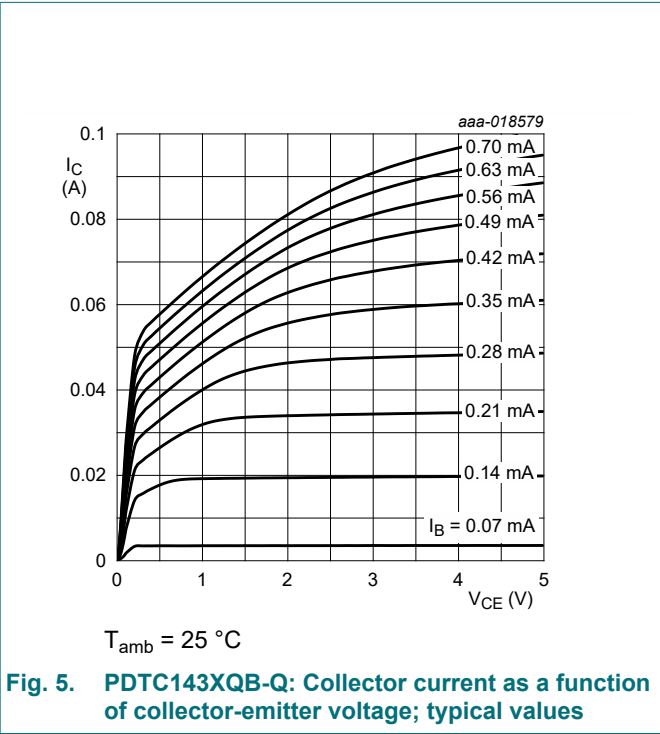
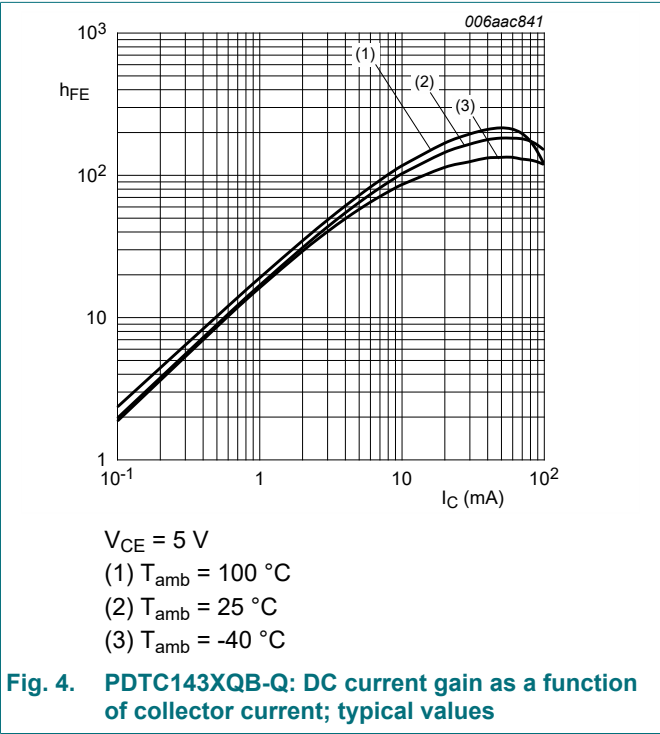
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{(BR)CBO}	collector-base breakdown voltage	I _C = 100 μA; I _E = 0 A		50	-	-	V
V _{(BR)CEO}	collector-emitter breakdown voltage	I _C = 2 mA; I _B = 0 A		50	-	-	V
I _{CBO}	collector-base cut-off current	V _{CB} = 50 V; I _E = 0 A		-	-	100	nA
I _{CEO}	collector-emitter cut-off current	V _{CE} = 30 V; I _B = 0 A		-	-	100	nA
		V _{CE} = 30 V; I _B = 0 A; T _j = 150 °C		-	-	5	μA
I _{EBO}	emitter-base cut-off current						
	PDTC143XQB-Q	V _{EB} = 5 V; I _C = 0 A		-	-	600	μA
	PDTC123JQB-Q			-	-	180	μA
	PDTC143ZQB-Q			-	-	170	μA
	PDTC114YQB-Q			-	-	150	μA
	PDTC124XQB-Q			-	-	120	μA
h _{FE}	DC current gain						
	PDTC143XQB-Q	V _{CE} = 5 V; I _C = 10 mA		50	-	-	
	PDTC123JQB-Q			100	-	-	
	PDTC143ZQB-Q			100	-	-	
	PDTC114YQB-Q	V _{CE} = 5 V; I _C = 5 mA		100	-	-	
	PDTC124XQB-Q			80	-	-	
V _{CEsat}	collector-emitter saturation voltage						
	PDTC143XQB-Q	I _C = 10 mA; I _B = 0.5 mA		-	-	100	mV
	PDTC123JQB-Q	I _C = 5 mA; I _B = 0.25 mA		-	-	100	mV
	PDTC143ZQB-Q			-	-	100	mV
	PDTC114YQB-Q			-	-	100	mV
	PDTC124XQB-Q	I _C = 10 mA; I _B = 0.5 mA		-	-	100	mV
V _{I(off)}	off-state input voltage						
	PDTC143XQB-Q	V _{CE} = 5 V ; I _C = 100 μA		-	0.8	0.3	V
	PDTC123JQB-Q			-	0.6	0.5	V
	PDTC143ZQB-Q			-	0.6	0.5	V
	PDTC114YQB-Q			-	0.7	0.5	V
	PDTC124XQB-Q			-	0.8	0.5	V
V _{I(on)}	on-state input voltage						
	PDTC143XQB-Q	V _{CE} = 0.3 V ; I _C = 20 mA		2.5	1.5	-	V
	PDTC123JQB-Q	V _{CE} = 0.3 V ; I _C = 5 mA		1.1	0.75	-	V
	PDTC143ZQB-Q	V _{CE} = 0.3 V ; I _C = 5 mA		1.3	0.9	-	V
	PDTC114YQB-Q	V _{CE} = 0.3 V ; I _C = 1 mA		1.4	0.8	-	V
	PDTC124XQB-Q	V _{CE} = 0.3 V ; I _C = 2 mA		2.0	1.1	-	V

50 V, 100 mA NPN resistor-equipped transistors

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R1	bias resistor 1 (input)					
	PDTC143XQB-Q		[1] 3.3	4.7	6.1	kΩ
	PDTC123JQB-Q		1.54	2.2	2.86	kΩ
	PDTC143ZQB-Q		3.3	4.7	6.1	kΩ
	PDTC114YQB-Q		7	10	13	kΩ
	PDTC124XQB-Q		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio					
	PDTC143XQB-Q		[1] 1.7	2.13	2.6	
	PDTC123JQB-Q		17	21	26	
	PDTC143ZQB-Q		8	10	12	
	PDTC114YQB-Q		3.7	4.7	5.7	
	PDTC124XQB-Q		1.7	2.13	2.6	
f _T	transition frequency	V _{CE} = 5 V; I _C = 10 mA; f = 100 MHz	[2] -	230	-	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = i _e = 0 A; f = 1 MHz	-	-	2.5	pF

[1] See "Section 11: Test information" for resistor calculation and test conditions
[2] Characteristics of built-in transistor



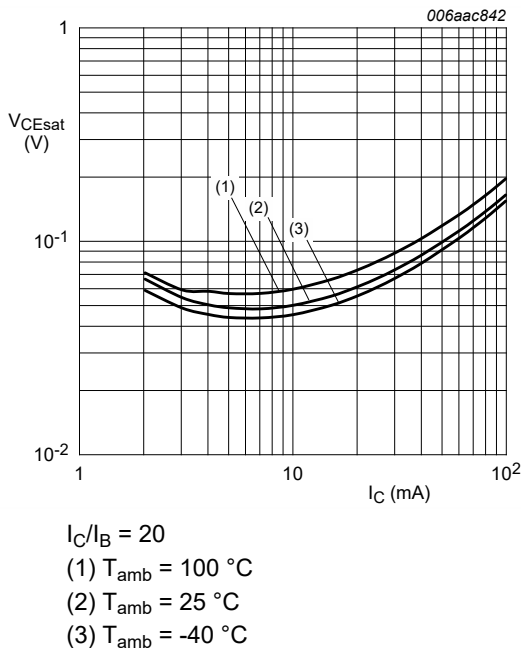


Fig. 6. PDTC143XQB-Q: Collector-emitter saturation voltage as a function of collector current; typical values

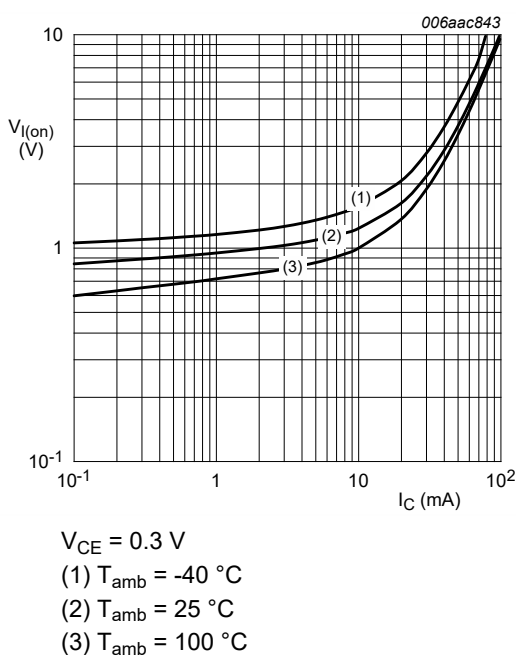


Fig. 7. PDTC143XQB-Q: On-state input voltage as a function of collector current; typical values

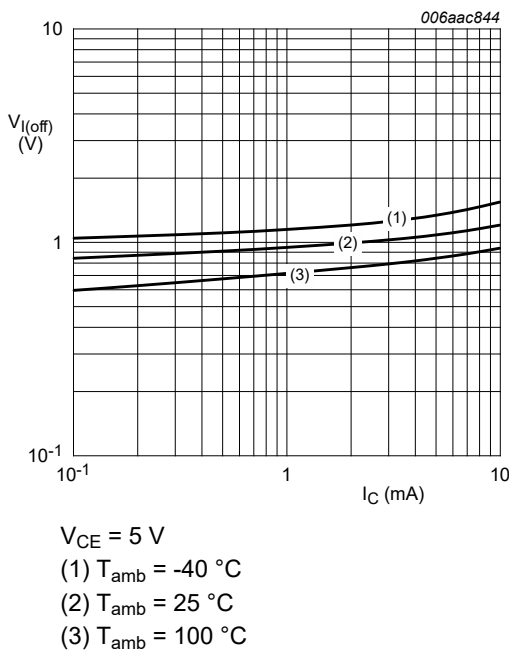


Fig. 8. PDTC143XQB-Q: Off-state input voltage as a function of collector current; typical values

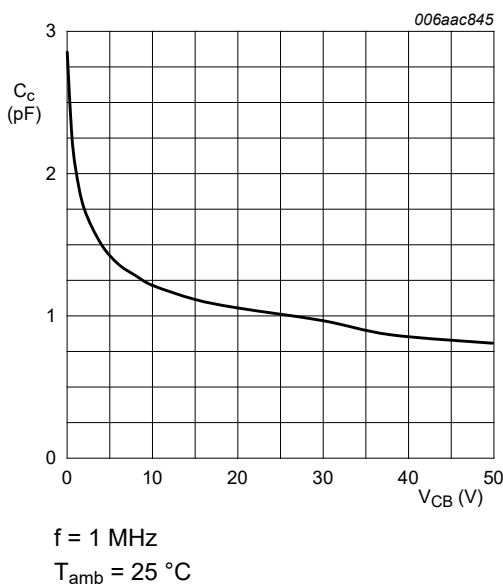


Fig. 9. PDTC143XQB-Q: Collector capacitance as a function of collector-base voltage; typical values

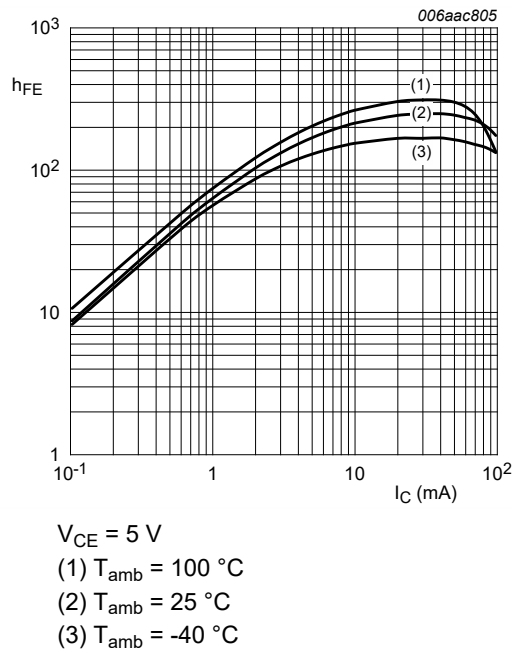


Fig. 10. PDTC123JQB-Q: DC current gain as a function of collector current; typical values

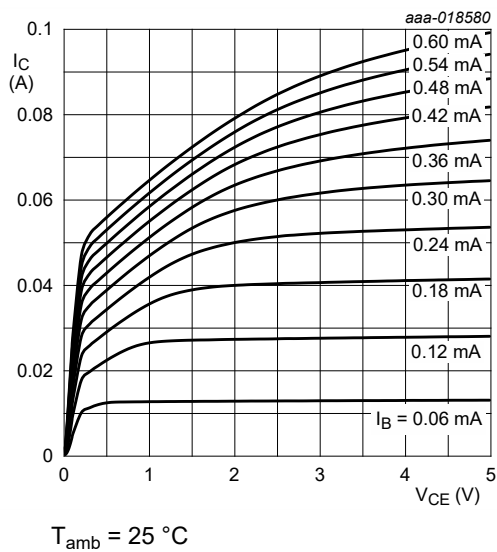


Fig. 11. PDTC123JQB-Q: Collector current as a function of collector-emitter voltage; typical values

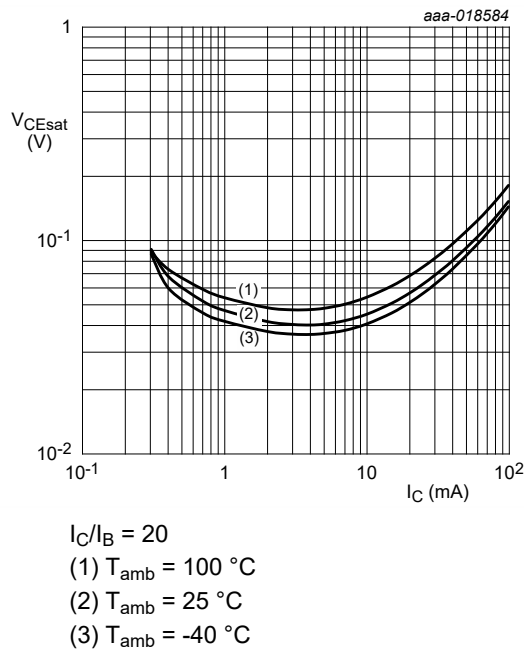


Fig. 12. PDTC123JQB-Q: Collector-emitter saturation voltage as a function of collector current; typical values

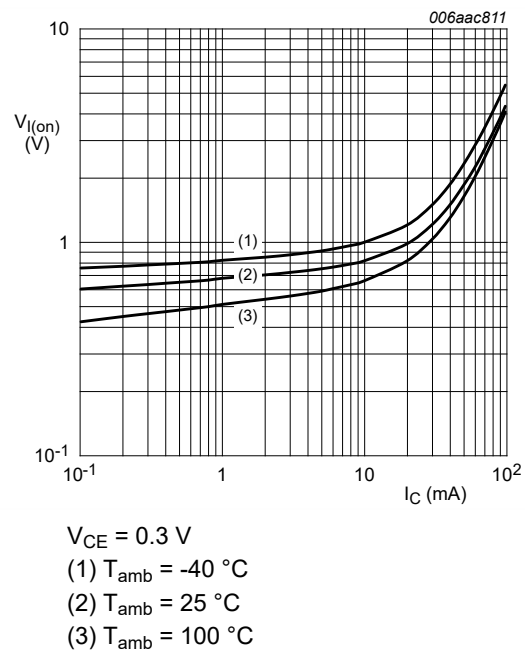


Fig. 13. PDTC123JQB-Q: On-state input voltage as a function of collector current; typical values

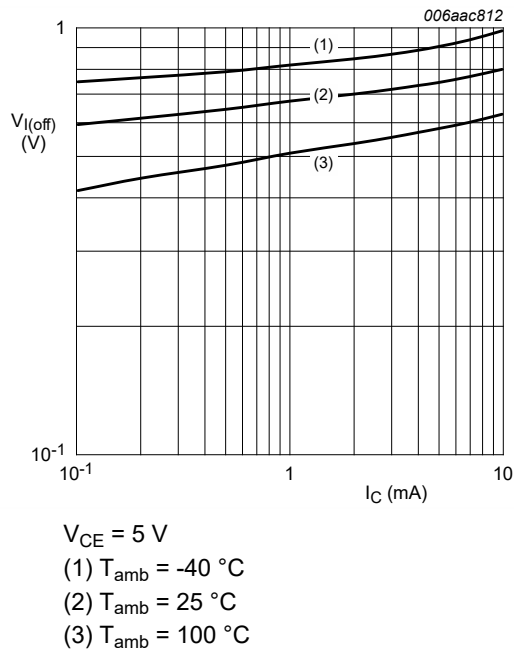


Fig. 14. PDTC123JQB-Q: Off-state input voltage as a function of collector current; typical values

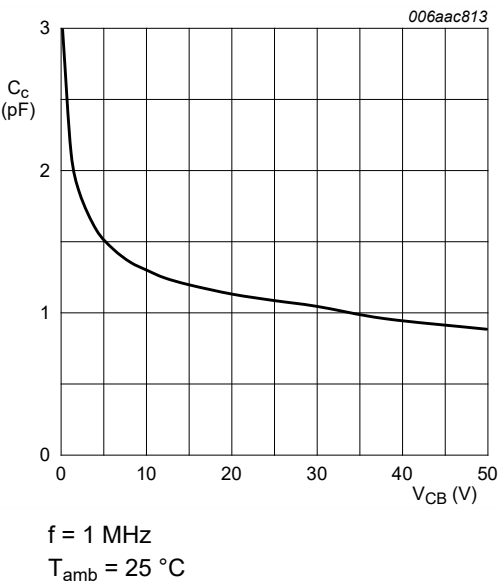


Fig. 15. PDTC123JQB-Q: Collector capacitance as a function of collector-base voltage; typical values

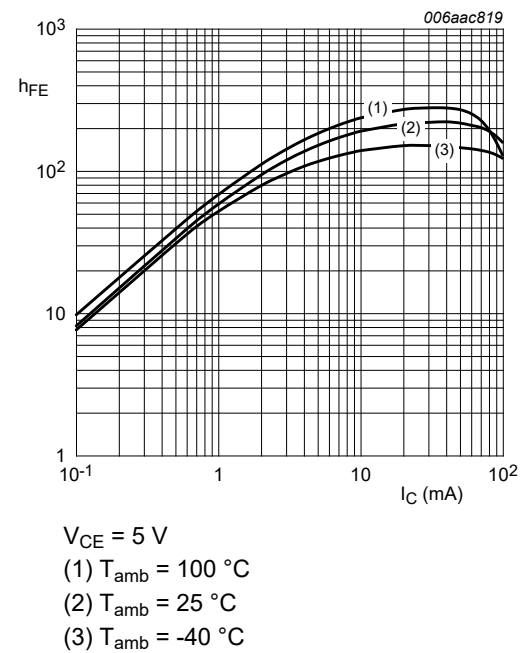


Fig. 16. PDTC143ZQB-Q: DC current gain as a function of collector current; typical values

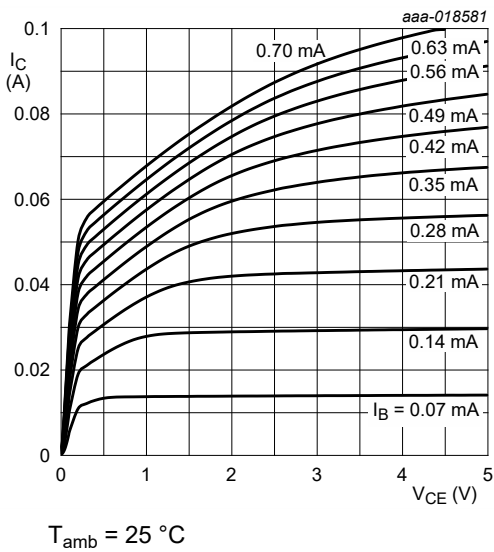


Fig. 17. PDTC143ZQB-Q: Collector current as a function of collector-emitter voltage; typical values

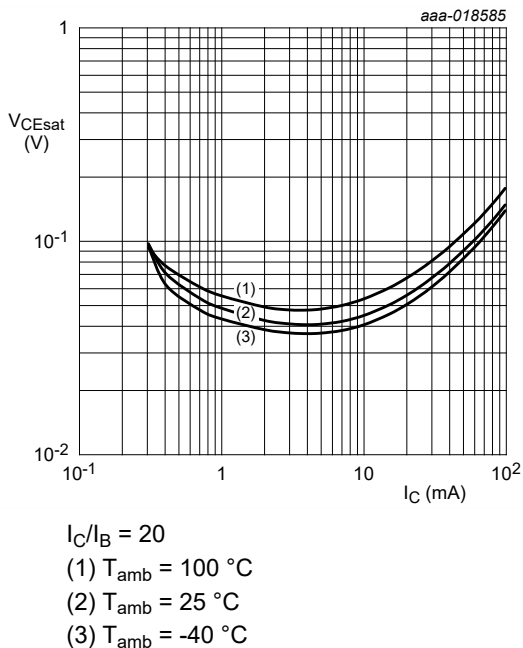


Fig. 18. PDTC143ZQB-Q: Collector-emitter saturation voltage as a function of collector current; typical values

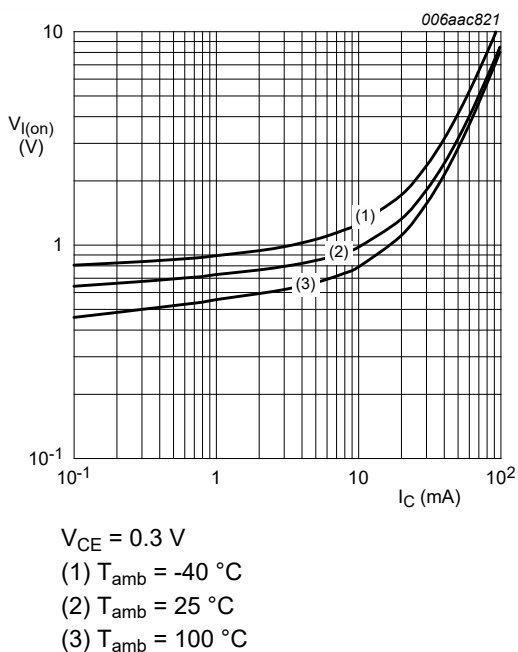


Fig. 19. PDTC143ZQB-Q: On-state input voltage as a function of collector current; typical values

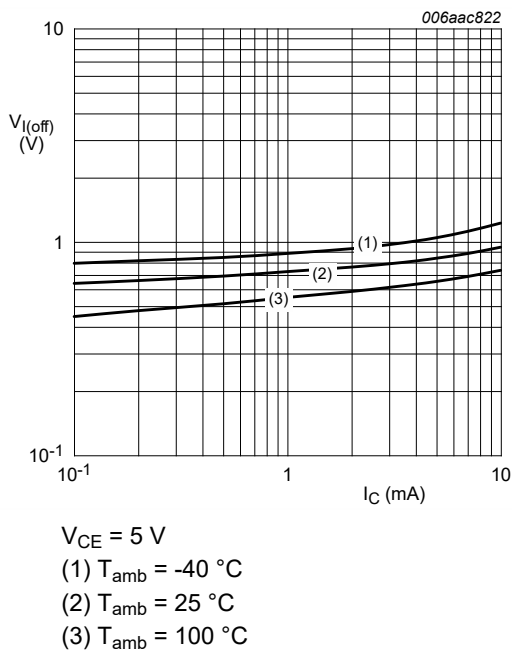


Fig. 20. PDTC143ZQB-Q: Off-state input voltage as a function of collector current; typical values

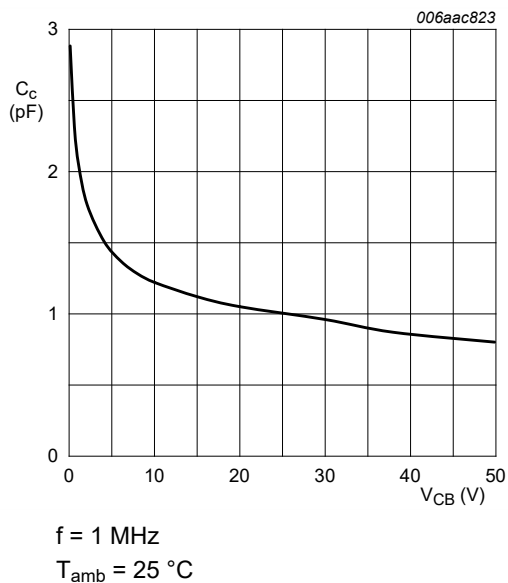


Fig. 21. PDTC143ZQB-Q: Collector capacitance as a function of collector-base voltage; typical values

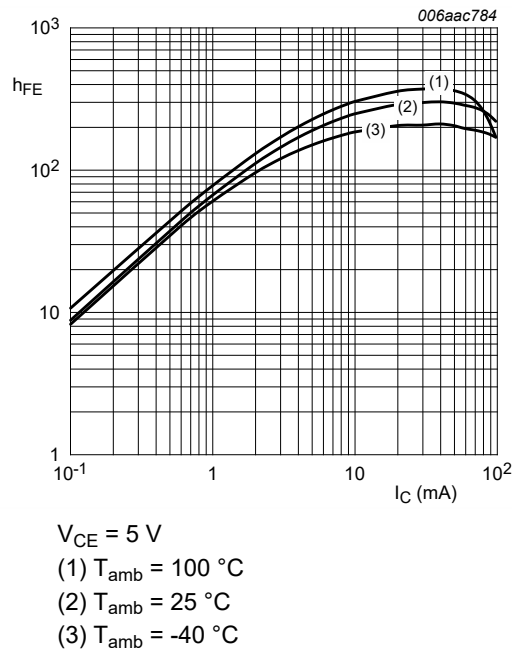


Fig. 22. PDTC114YQB-Q: DC current gain as a function of collector current; typical values

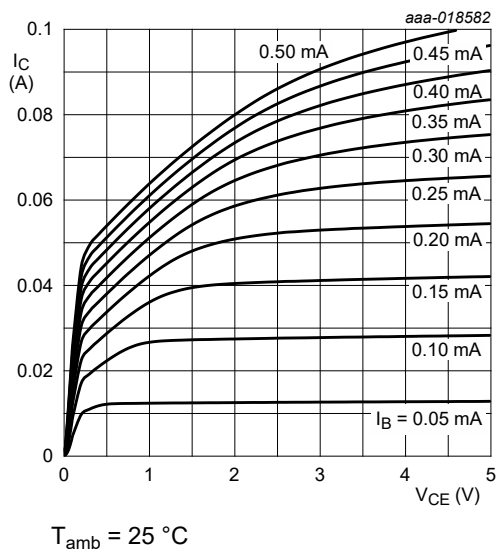


Fig. 23. PDTC114YQB-Q: Collector current as a function of collector-emitter voltage; typical values

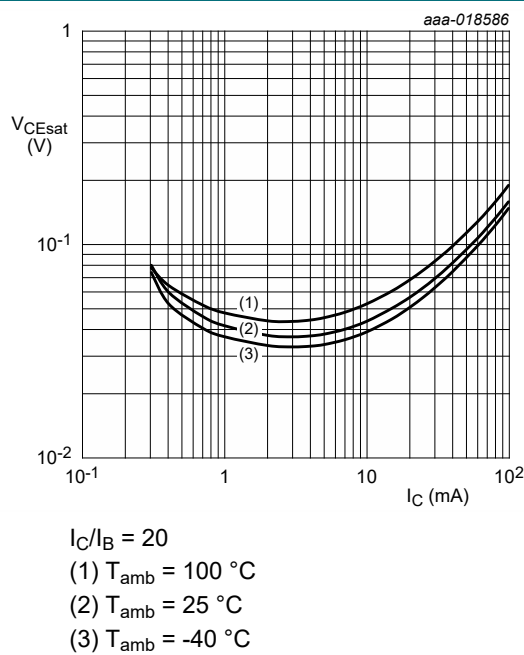


Fig. 24. PDTC114YQB-Q: Collector-emitter saturation voltage as a function of collector current; typical values

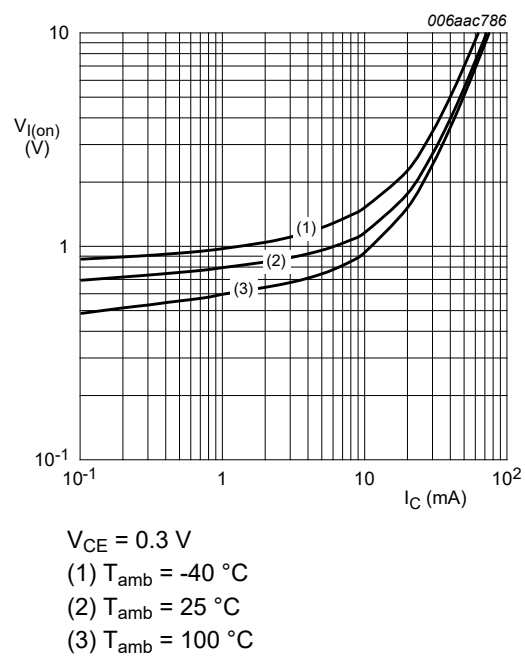


Fig. 25. PDTC114YQB-Q: On-state input voltage as a function of collector current; typical values

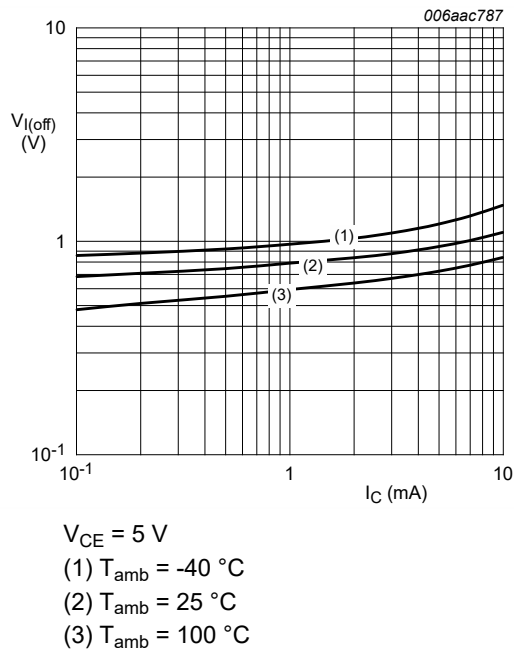


Fig. 26. PDTC114YQB-Q: Off-state input voltage as a function of collector current; typical values

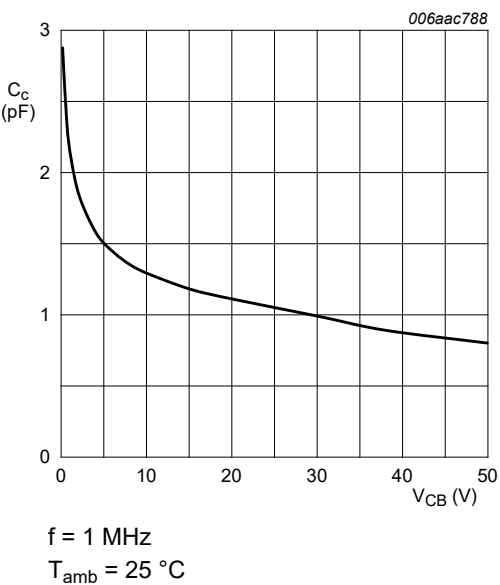


Fig. 27. PDTC114YQB-Q: Collector capacitance as a function of collector-base voltage; typical values

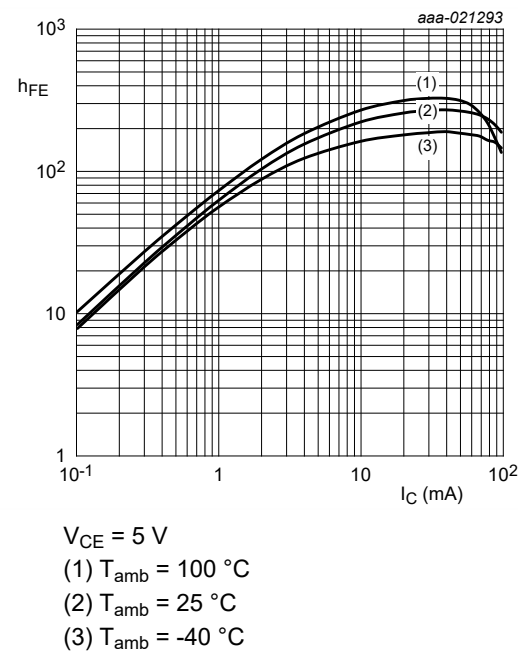


Fig. 28. PDTC124XQB-Q: DC current gain as a function of collector current; typical values

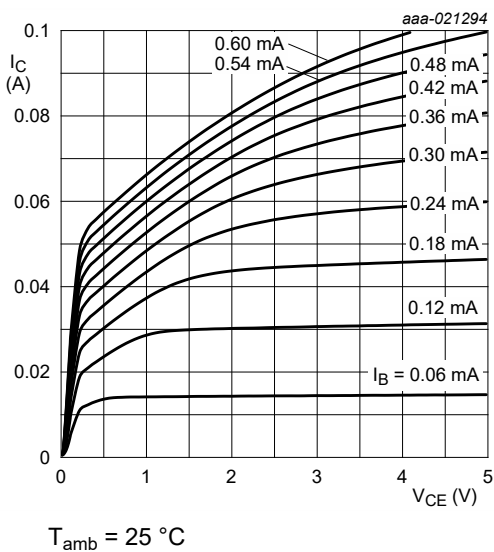


Fig. 29. PDTC124XQB-Q: Collector current as a function of collector-emitter voltage; typical values

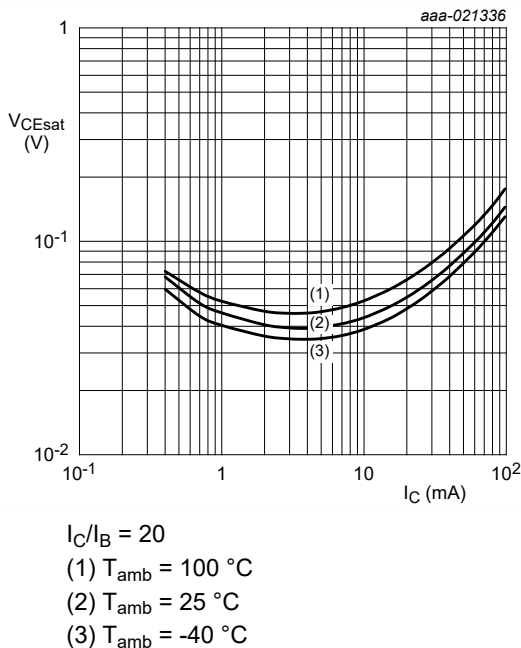


Fig. 30. PDTC124XQB-Q: Collector-emitter saturation voltage as a function of collector current; typical values

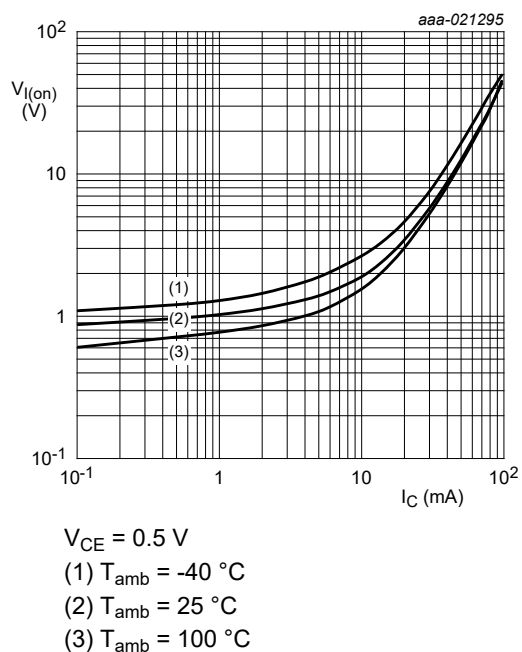


Fig. 31. PDTC124XQB-Q: On-state input voltage as a function of collector current; typical values

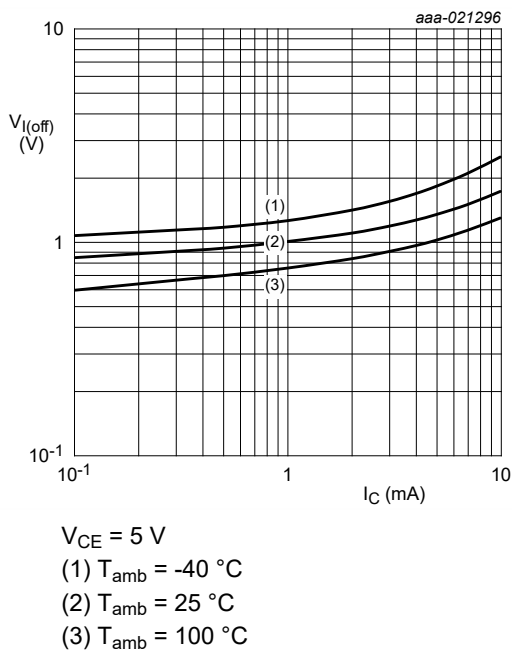


Fig. 32. PDTC124XQB-Q: Off-state input voltage as a function of collector current; typical values

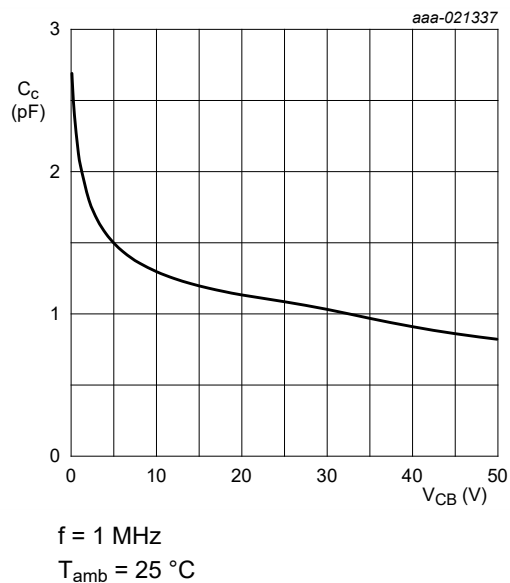
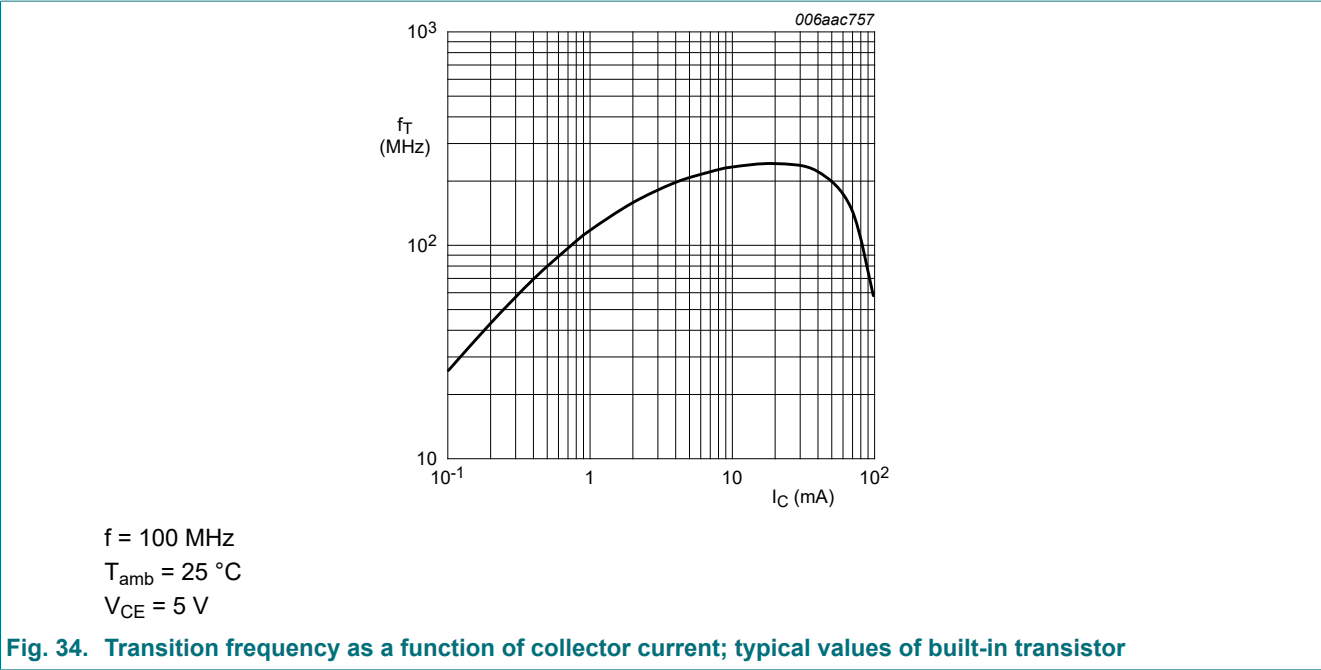


Fig. 33. PDTC124XQB-Q: Collector capacitance as a function of collector-base voltage; typical values



11. Test information

Resistor calculation

- Calculation of bias resistor 1 (R1)

$$R1 = \frac{V(I12) - V(I11)}{I12 - I11}$$
- Calculation of bias resistor ratio (R2/R1)

$$\frac{R2}{R1} = \frac{V(I14) - V(I13)}{R1 \cdot (I14 - I13)} - 1$$

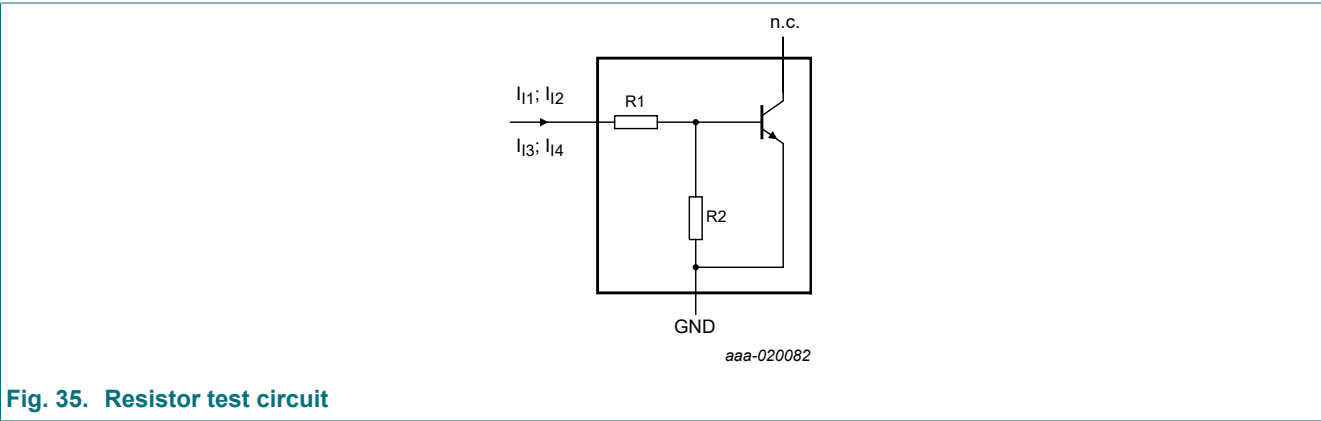


Fig. 35. Resistor test circuit

Resistor test conditions

Table 9. Resistor test conditions

Type number	R1 (kΩ)	R2 (kΩ)	Test conditions			
			I11	I12	I13	I14
PDTC143XQB-Q	4.7	10	350 μA	450 μA	-350 μA	-450 μA
PDTC123JQB-Q	2.2	47	90 μA	140 μA	-55 μA	-105 μA
PDTC143ZQB-Q	4.7	47	90 μA	140 μA	-55 μA	-105 μA
PDTC114YQB-Q	10	47	90 μA	140 μA	-55 μA	-105 μA
PDTC124XQB-Q	22	47	55 μA	105 μA	-55 μA	-105 μA

11.1. Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.

12. Package outline

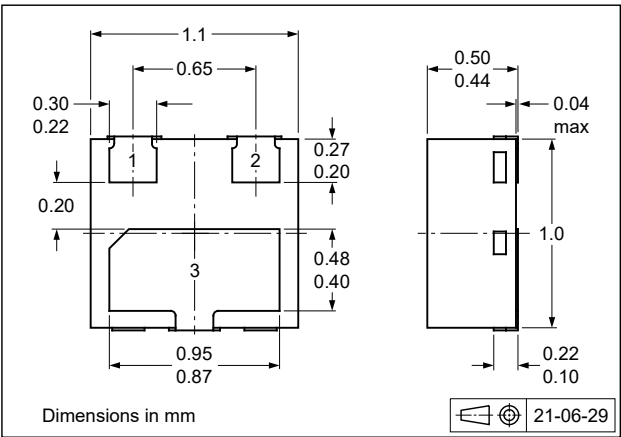


Fig. 36. Package outline DFN1110D-3 (SOT8015)

13. Soldering

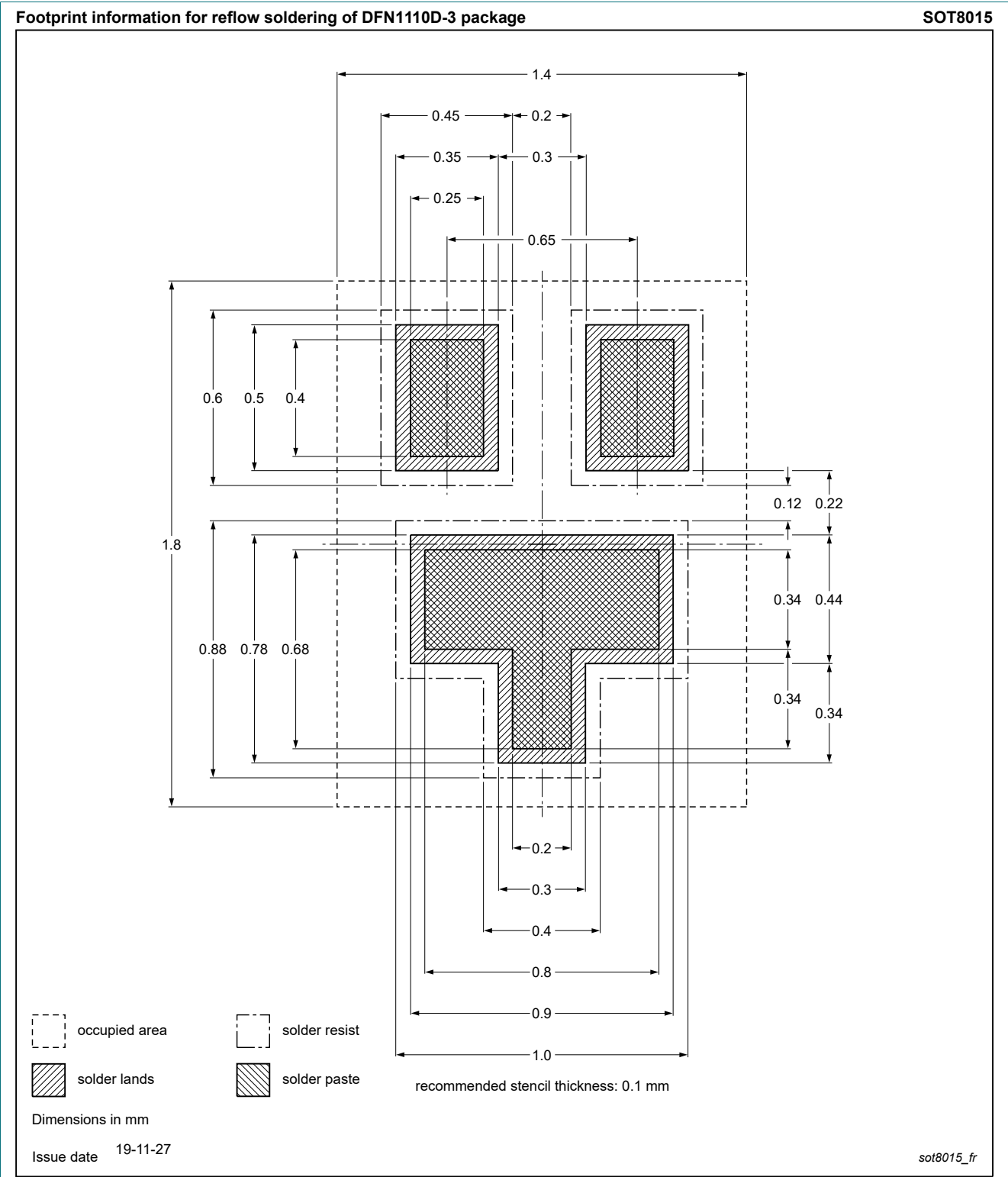


Fig. 37. Reflow soldering footprint DFN1110D-3 (SOT8015)

14. Revision history

Table 10. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PDTC143X_TO_124XQB-Q_SER v.1	20211001	Product data sheet	-	-

50 V, 100 mA NPN resistor-equipped transistors

15. Legal information

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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